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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/670,964	09/26/2003	Yoshiaki Satoh	Q77622	7027

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EXAMINER
JAWORSKI, FRANCIS J

ART UNIT	PAPER NUMBER
3737	

DATE MAILED: 07/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/670,964	SATOH, YOSHIAKI	
	Examiner	Art Unit	
	Jaworski Francis J.	3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 - 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *September 26, 2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and 3the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

[The terminology "steering range" is understood to pertain to angular direction sets or sector spans in azimuth or elevation or both, for example as shown in applicants' Figure 7. When the span is two dimensional the terminology embraces an area meaning a span in two directions. This is in contradistinction to an association of 'range' with 'depth' as the term is also used in the art. Since this is a majority interpretation by the Examiner based upon overall specification use of this terminology, applicants are asked to clarify what is meant by specification pages 12-13 bridging which apparently intimates that both the sector span definition and the traditional range=depth interpretation apply.]

I. Steering-Range-Independent Rejections

a. Focal length -Dependent

Claims 1,4,7 and 10 are rejected under 35 U.S.C. 102(b) as anticipated by Mo et al (US6014897) under the interpretation that the patent teaches that, using plural transmit sections 24 and receiving channels 28 and multiplex switch sections, the sparse array density distribution may be changed as a function of focal distance within a scanline, see col. 6 lines 41-61.

Hence one acts to at least partly 'change a sparse pattern by switching' during the progress of a scan line.

b. Transmit-Receive Dependent

Claims 1,4,7 and 10 are further rejected under 35 U.S.C. 102(e) as being anticipated by Mo et al or Grenon et al (US6783497) or Lockwood et al (US5537367) insofar as the former also teaches in the aforementioned passage that or between transmission and reception in order to optimize the overall beam profile wrt grating lobes whereas Grenon et al teaches use of a sparse array using different preferably non-overlapping annular and central sparse array elements for transmission and reception in conjunction with associated transmit and receive circuits and multiplex switches. In Lockwood et al col. 3 lines 37-46 taken together with the A,B sets of Figs. 3 – 21 the transmit-receive periodicity differences are used to reduce off-axis grating lobes.

Hence one acts in each case to at least partly 'change a sparse pattern by switching' between transmission and reception.

c. Successive Spatial Location Dependent

Claims 1,4,7 and 10 are further rejected under 35 U.S.C. 102(b) as being anticipated by Trahey et al (US5673699) or Abend et al (US6682483). The former mentions that in a system for altering spatial location of the aperture in order to spatially average out phase aberrations, a sparse array may have elements switched on successive transmissions in association with the translational shift to accomplish the same effect, see col. 6 lines 22-38.

Abend et al in col. 11 lines 23-30 solves the problem of grating lobe deterioration of a sparse array at off-axis angles by suggesting that the sparse pattern be angularly

shifted en bloc using multiplexed switching between panels apparently approximating the angular changes associated with convex or spherical or negative lens re-directing of the transmissions. The sparse pattern is steering range independent since only the transducer elements which generate the pattern are changed.

In either case one technically acts to at least partly 'change a sparse pattern' spatially by switching to a new spatial position.

d. Mode-Dependent

Claims 1,4,7 and 10 are further rejected under 35 U.S.C. 102(b) as being anticipated by Hoctor et al (US5278757) or Holm (US6279399) . Hoctor is cited solely for its Figs.15-16 and col. 22 lines 56-65 suggesting that an ordinary phased array may be switched into a sparse array high resolution mode of larger aperture.

Hence one may characterize such as 'to change a sparse pattern by switching (into a conventional one)' during an examination.

II. Steering Range Dependent Rejection (Core Argument)

Claims 1 2,4-5, 7-8 and 10-11 are rejected under 35 U.S.C. 102(e) as being anticipated by Kawagishi et al (US6635018) or in the alternative under 35USC103(a) as obvious based upon Kawagishi et al in view of Ossmann et al (US6527723). Kawagishi et al in col. 3 lines 14-28, col. 12 lines 18-64 and associated Figs. 16A and 16B teaches a switched pulser circuit set and receiver beamformer channels wherein a sparse array

is used to progressive attrite the element number to achieve uniform sound pressure across all directions of the steering range. In the alternative, Ossmann et al col. 3 lines 3-18 suggests that a grating lobe effect would also be something Kawagishi et al would act to avoid during this changing exercise.

Claims 3, 6, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kawagishi et al as applied to claims 1-2 above, and further in view of Snyder et al (US6120449) which evidences that it would have been well-known in the art to use a flash memory 58 to control the state of activation switching between multiplexers and transducer arrays such as is effectively called for by Figs. 16A,B of Kawagishi et al..

Patentability Assessment

Broadest claims are opposed because sparse array patterns were known to be switched with change in focal depth, between transmit and receive for grating lobe suppression, with change in spatial position of the emission axis and during mode changes into modes where the pattern is inapplicable.

Claims limited to control of sparse pattern changes with steering angle or steering angle span are opposed based upon Kawagishi et al. Both Kawagishi et al and applicants alter distribution density of a sparse array with steering angle (K. col. 12 lines 27-31 versus spec. page 9 lines 19-22) however this is done for dramatically different purposes in the two instances - Kawagishi et al introduces a progressive sparse array decimation with diminished steering angle per Figs. 16A,B in order to compensate for the echo intensity-sound pressure squared relationship which applies during tissue or

contrast agent harmonic imaging that tends to amplify the effect of ordinary sound pressure diminution during off-axis steering on the image display (col. 2 lines 29-65). At best, Kawagishi et al might be expected to pay attention to the particular on-axis sparse distribution used vis-à-vis generation of side lobes in their attempt to control sound pressure using element density (see Ossmann et al (US6527723) col. 3 lines 3-18), and the latter reference is in effect superfluously applied above in order to completely advance that issue. Applicants by contrast are acting to flexibly configure the sparse array pattern to minimize grating lobes during sparse array use in wide sector scans for example during volumetric imaging where the sparse array is advantageous in terms of minimizing the number of 2D array connections, in effect providing a compensation during sparse array use in and of itself. In other words this is a form of compensating for sparse array-induced innacuracy in and of itself. Therefore it appears that patentably distinguishing wordings are devisable to represent this distinction over the applied prior art..

Hussain et al (US5911692) is cited as of interest as directed to steering angle-independent sparse array optimization.

Any inquiry concerning this communication should be directed to Jaworski Francis J. at telephone number 571-272-4738.

FJJ:fjj

07192005

Francis J. Jaworski
Primary Examiner